

A Smart Solar Powered Automated Scarecrow for Agriculture

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ABSTRACT

The aim of this project is to design, fabrication, and development of solar powered smart fully automated scarecrow model for agricultural field. Indian farmers are facing problems in protecting crops from wild animals during day and night time. In this present invention we are going to implement a rotary scarecrow model with producing unnatural audio sound with visual high beam flashes of LED lamp. This system totally powered by solar panel, during day time solar energy will be saved in rechargeable battery and in night time this battery power will be utilize. The purpose of this project model is to protect agricultural crops and keeps away unwanted wild animals from agricultural crops production area. The invention generally comprises a substantially hollow housing having a removable top portion mounted atop a rigid support frame member. The exterior of this housing includes a light and sound emitting devices attached there. The interior portion of the housing includes an electronic controller along with a motor assembly for imparting rotational motion to the rotatable mounted elongated arms on the exterior of the housing. In this system motion sensor are interfaced to detect the motion of living body present in sensor region. Whenever sensor detects any motion in farm of any living things then scarecrow starts rotating and produces sound and flashes light.

KEYWORDS: PIR Motion Sensor, Gear Motor, Motor Driver, Solar Panel, Solar Charge Controller, Atmega328 Microcontroller

1. INTRODUCTION

The Indian economy is based on agriculture field, development in agriculture field lead to raise economic status of country. In recent studies on agriculture field we have seen that the farmers were facing problems to protect crop production field from wild animals, many times the crops production areas have attacked by these animals and destroyed the crops, so to overcome this problem we have researched and are going implement a fully automated solar powered scarecrow system. In this project we are implementing a rotary scarecrow model which will make motion with audio visual alert whenever any animal comes near to crops production areas. In this system we are using a PIR motion sensor to detect motion and presence of any living body near the sensor range. If any motion detected then motion sensor generate the output signal which is connected to the microcontroller. Microcontroller then activates relays of generating audio signal and light signal, and also activates the motor driver circuit to start gear motor which will rotate the dummy scarecrow. The

system is powered by a 12 Volt rechargeable battery connected to a 20 watt solar panel with solar charge controller. This system does not require any external electricity to run the system, it is totally works on solar energy which is freely available in nature. The main hardware parts are used to implement this model are solar panel, solar charge controller, battery, microcontroller, motion sensors and gear motor. The solar panel converts the solar energy into the electrical energy. This electrical power is fed to the battery through the solar charge controller. The purpose of solar charge controller is to protect battery from over charging and maintain constant voltage during charging cycle. The LDR is interfaced to the system to enable system only at night time, because the motion sensors do not work at day time. The invention generally comprises a hollow housing having a removable top portion mounted at top a rigid support frame member. The exterior of the housing includes a light and sound emitting devices attached there, in addition rotatable mounted dummy scarecrow model

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therein with producing unnatural sounds upon rotation of such for scaring deer and other unwanted animals keep away. The interior portion of the housing includes an electronic controller in electrical connection with a power relay for energizing the mentioned electrical components, along with a motor assembly for imparting rotational motion to the rotatable mounted shaft on the exterior of the housing. The automation in agriculture could help to farmers to reduce their effort and their working time the automation in agriculture field could be more effective and efficient as compare to tradition methods of framing. So our focus will be on reduce cost, daily working hours, environmental all impact and safety issues and most important is to reduce farmer's effort.

2. HARDWARE DESCRIPTION:

The hardware parts and components used to make this model are listed and described below as,

A. DC Gear Motor:



Fig.1

A gear motor is a type of electro-mechanical motor that is designed to produce higher torque while maintaining low power consumption and low speed. Gear motors have many applications in automation systems. A geared DC Motor has a gear assembly attached to the motor. The speed of motor is calculated in terms of rotations of the shaft per minute. The gear assembly helps in increasing the torque and reducing the speed. Using the correct combination of gears in a gear motor, the speed can be reduced to any required figure. This concept where gears reduce the speed of the vehicle but increase its torque is known as gear reduction. This Insight will explore all the minor and major details that make the gear head and hence the working of geared DC motor.

B. PIR Motion Sensor:

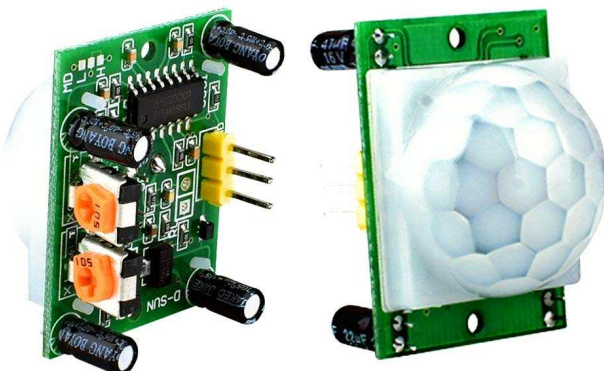


Fig: 2

PIR stands for Passive Infrared Sensor. Any object radiates IR rays and these rays are sensed by these sensor. This sensor is able to detect any living body passed by its range and generate digital output signal. It consist of fresnel lens, pyroelectric material. The fresnel lens is made up of high density polythene concentrates the incoming infrared radiations so that they fall on that pyroelectric material. Pyroelectric material detects the changes in infrared radiation and generates an output signal. It works on dc 5 v supply.

C. Solar Charge Controller:



Fig: 3

A solar charge controller or solar charge regulator is basically a voltage and current regulator to keep batteries safe from overcharging. It regulates the voltage and current coming from the solar panels going to the battery. Most of the 12V solar panels generates output about 16 to 20 volts, so if there is no regulation the batteries will be damaged from overcharging. Most batteries need around 14 to 14.5 volts to get fully charged. So the solar charge controller device is must to charge the battery and extent battery life.

D. Motor Driver Module:



Fig: 4

Here the purpose of motor driver module is to provide full power to dc gear motor. It is a high voltage and

high current dual full bridge driver designed to accept standard logic levels and drive inductive loads like DC and stepping motors. Two enable inputs are provided to enable or disable the device independently of the input signals. The emitters of the lower transistors of each bridge are connected together and the corresponding external terminal can be used for the connection of an external sensing resistor. An additional supply input is provided so that the logic works at a lower voltage level.

E. Microcontroller Atmega328:

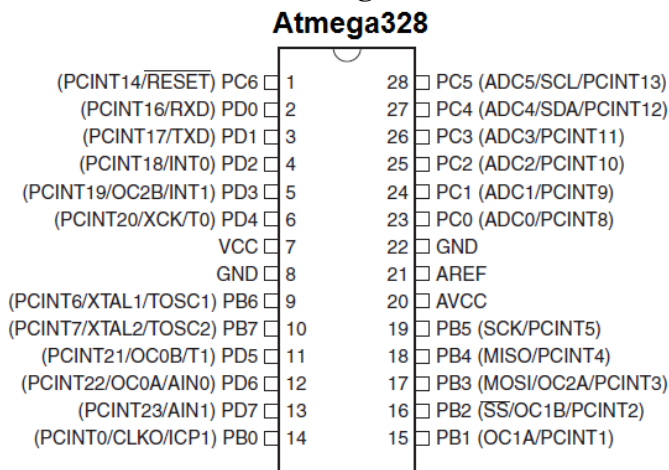


Fig:5

The microcontroller controls the whole system. It accepts the signals from motion sensors and generates output to drive dc gear motors as per coding. It is a Atmel 8-bit AVR RISC-based microcontroller with 32KB ISP flash memory and read-while-write capabilities, 1KB EEPROM, 23 general purpose I/O lines, 32 general purpose working registers, 3 flexible timer/counters with compare modes, internal, external interrupts, serial programmable USART, a byte-oriented 2-wire serial interface, SPI serial port, 6-channel 10-bit A/D converter programmable watchdog timer with internal oscillator, and five software selectable power saving modes. The device operates between 1.8-5.5 volts.

3. SOFTWARE DISCRIPTION (ARDUINO IDE):

Arduino IDE is an open source software that is mainly used for writing and compiling the code into the Arduino Module. It is an official Arduino software, making code compilation too easy that even a common person with no prior technical knowledge can get their feet wet with the learning process. It is easily available for operating systems like MAC, Windows, Linux and runs on the Java Platform that comes with inbuilt functions and commands that play a vital role for debugging, editing and compiling the code in the environment. A range of Arduino modules available in market, each of them contains a microcontroller on the board that is actually

programmed and accepts the information in the form of code. The main code, also known as a sketch, created on the IDE platform will ultimately generate a Hex File which is then transferred and uploaded in the controller on the board. The IDE environment mainly contains two basic parts: Editor and Compiler where former is used for writing the required code and later is used for compiling and uploading the code into the given Arduino Module. This environment supports both C and C++ languages.

4. BLOCK DIAGRAM:

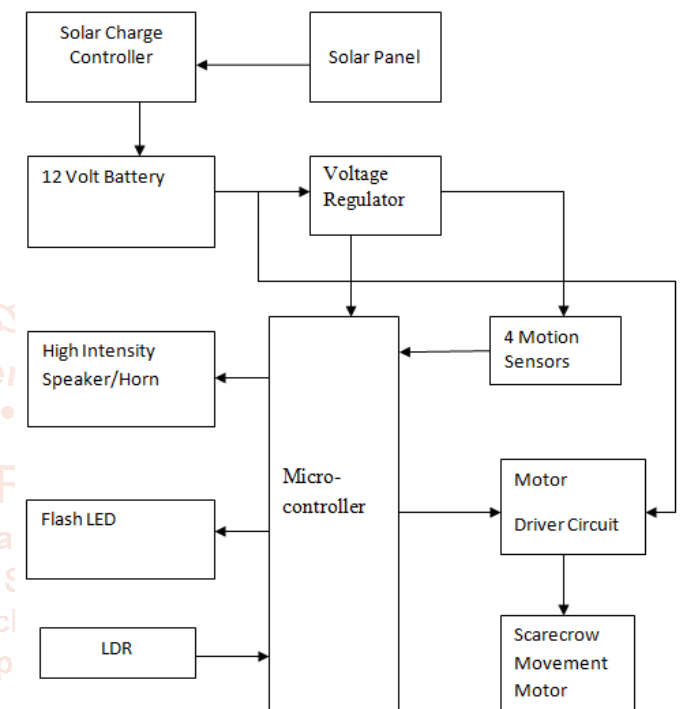


Fig: 6

WORKING OF THE SYSTEM:

Above block diagram shows the assembly and circuit connections of automated scarecrow. At first stage the solar panels convert the solar energy into electrical form, which is then fed to solar charge controller. Solar charge controller charges the battery hence solar energy stored in the battery as in electrical form. The system utilizes this battery power for further all operations. The voltage regulators block is for regulating the voltage levels. There are four PIR sensors interfaced to microcontroller. These four sensors fixed at four directions to capture motion readings. The light dependent resistor also interfaced, this sensor will help the system to check it is day or night. So the system remain activate on at night time, in day time PIR sensors won't work. Whenever any motions detected by motions sensors the microcontroller will send command to motor driver to start the gear motor, this gear motor has attached to the rotary shaft of dummy scarecrow. So the scarecrow will start rotating for few minutes. The microcontroller also activates the high intensity horn which produces high pitch sounds, and the LED flash

light. This cycle will continue this ways. By listening unwanted sound with rotary motions of scarecrow the wild animals stay away from crop production area. So this system will be very helpful for the Indian farmers.

5. RESULT:

The results shows the final implementation of the project model scarecrow.



Fig 7: Final Implementation

6. CONCLUSION

We have implemented and have checked the systems output. The system works as we have imagined and keeps away the wild animals from agriculture land, because of high pitch sounds irritates animals and motions of scarecrow scares them. This system will be

beneficial for agriculture land, it protects the crops from attack of wild animals.

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